RMOSIS3 FINAL REPORT

REPORTING PERIOD: OCT 93 - DEC 96

RMOSIS FOR GOVERNMENT SUPPORT

DARPA CONTRACT MDA972-94-0002

CONTRACT PERIOD OF PERFORMANCE: 10/31/93 THROUGH 12/31/96

Prepared by: Wes Hansford

University of Southern California, Information Sciences Institute
4676 Admiralty Way, Marina del Rey, California 90292-6695
(310) 822-1511

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USC INFORMATION SCIENCES INSTITUTE
4676 ADMIRALTY WAY
MARINA DEL REY, CA 90292-6695

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RMOSIS3 CONTRACT OVERVIEW

The Information Sciences Institute of the University of Southern California (USC/ISI) provided services to NSA through the RMOSIS3 contract in three areas: fabrication runs, software development and support, and technology development. This contract started 1 October 1993 and concluded 31 December 1996, when it was replaced by the RMOSIS96 contract.

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TASK 1 - FABRICATION RUNS

USC/ISI provided administrative and contracting support for purchase of mask sets, wafer fabrication, assembly, and testing of integrated circuits. These were unclassified or classified at the level of SECRET or COMSEC. In providing such support, USC/ISI staff was not be required to handle any classified material. In general these involved the creation, production and delivery of:

- IC Photomasks
- IC Reticle Plates
- Silicon Wafers and Wafer Lots
- Assembly of Packaged Parts
- Multi-chip Modules
- Parametric Testing and Test Results

Functional Testing of Wafers, Die, Packages and Multi-chip Modules

Specific tasks that were performed

- Establish blanket purchase orders with selected mask fabricators, wafer fabricators, assemblers and test houses.
- Issue work orders for specific RMOSIS runs, as requested by the NSA.
- Coordinate the transfer of data, tooling and parts between the NSA and the mask house, the mask house and the wafer fabricator, the wafer fabricator and the packager, the packager and the test house, and the test house and the NSA.
- Track the progress of fabrication runs and send weekly reports to the NSA.
- Pay vendors when work has been completed and accepted by the NSA.
- Provide the NSA with monthly reports of funds omitted for fabrication services.

USC/ISI worked closely with vendors to track the progress of fabrication runs. Weekly status reports were provided to RMOSIS. **Appendix 1** lists the runs fabricated under this contract. As part of this task, USC/ISI qualified alternative sources for NSA CMOSX (0.8um) layout rules (with the HP CMOS26G process) and the CS050N layout rules (with the HP CMOS14TB process). A multisourceable (CMOSH) version of the layout rules for NSA-internal 0.5u fabrication process (CS050N) was also created.

USC/ISI also provided access to the unclassified MOSIS prototyping runs operated by USC/ISI. **Appendix 2** lists the IC designs fabricated by the MOSIS service under the 1104-NSA-MPR/NSA-RMOSIS3 account during this contract. The following table lists the MCM runs fabricated under this contract.

Design	Run Id	Design Name	Technology	Size
46086	N56K	PEANUT	MMS_D500	25x25mm
48058	N62F	TATERTOT	MMS_D500	47x47mm
48056	N62H	FOURRUNNER	MMS_D500	37x37mm

TASK 2 - SOFTWARE DEVELOPMENT AND SUPPORT

USC/ISI provided minor vendor engineering consulting as required for the support of the NSA run-closing software.

The main effort under this task was to maintain the process monitor test vehicles (e.g. Supercharger) and associated test code generation software. The parametric test system software was supported and several versions of test data and electrical process parameter software report generators were developed and maintained.

Wafer Selection

The MOSIS wafer selection system is comprised of three major parts: the Supercharger/test strip layout assembler, the test system software environment and the report generator. The layout for a process monitor along with the associated parametric test code files and report generator files are output from the generator. After compiling and linking on the test system, the test code can be called by command files for individual runs. The report generator processes data gathered by the test system. The report generator outputs are used for wafer selection/lot acceptance, etc.

Supercharger and test strips

The Supercharger assembler is implemented in ICL and runs under VAX/VMS. It consists of three sections: the assembler front end, Supercharger geometry generation library and layout/test code assembler. Requests for a set of electrical measurements are input to the front end. Valid requests are passed to the assembler, which calls geometry generation functions from the library and places these pieces of layout within the Supercharger framework (i.e., separate capacitor, parametric and functional test sections). The assembler forms the test code by putting together the calls to the necessary parametric test routines, interspersed with calls to prober move routines for local movement within the process monitor (e.g. to move from one row to the next).

A set of enhancements was created to the MOSIS layout generator to support the CMOSX (0.8u) Supercharger for the Racer-X test vehicle (and later on, the 0.5u version) for both silicided and non-silicided processes. These layout changes include :

1) A new test structure consisting of a poly comb (over active steps) to look for gate-drain and gate-source shorts (especially for silicide processes). This was configured as a large transistor (both for P and N channel) for leakage measurements.
2) The yield monitor was redesigned in CMOSX cells, using DDFSR (rather than DFFR) cells. This was later updated for 0.5u using the CS050N cells.
3) Three ring oscillators were designed using CMOSX cells (INV, NAND, NOR), each with 101 stages and an enable input and high/low frequency outputs separated by an 8-stage ripple counter composed of DFFR cells. These were also later updated for 0.5u using the CS050N cells.

Parametric test system

The test system software environment resides on a Keithley S400UX. The host computer of the 400 is a Sun SPARC workstation. This software environment is comprised of: (1) the actual measurement functions and (2) the framework that accesses these functions and also implements interfacing to the wafer prober, transferring of files, creation of wafer map files for reticle runs, etc. These functions are implemented in C and run under the Unix operating system.

Earlier the parametric test system was a Keithley 350 with a VAX host computer running VMS. During this contract, an existing VMS-based Keithley S450 replaced this system. The S450 was later converted to a Unix-based S400UX . An upgraded MOSIS test environment software (bundled with the Keithley hardware and software) was developed at USC/ISI and installed at ISI and NSA. Test files for the CMOSN, CMOSX and CMOSH test vehicles were generated as new test procedures and/or test vehicles were developed and put in use at NSA.

Specific tasks that were performed:

- Loaded inverter output measurements added to existing inverter tests
- Measurements of non-standard capacitor structures which requited obtaining a special probe card

- Tests of SOI wafer lots presenting numerous unique issues (weak insulator, channel punchthrough, polyimide on pads, etc.)
- Special requests for graphical mapping of parametric and functional data to physical wafer locations
- Functional test of XTACH050 (including conversion of Trillium vectors to IMS format, exercise and partial debugging of at-speed vectors, and successful 8.33 MHz testing of IBM SOI parts)
- Investigation of anomalous ring oscillator measurements and resolution by incorporation of integral Schmitt buffer on the ring oscillator enable line
- Creation of reporting capabilities for SPL PCM built by NSA from ISI test structures
- Implementation of p-substrate ("p-well") sheet resistance bridge structure developed by NSA
- Development of RMOSIS functional device (yield monitor) test database with reporting capabilities, including vendor performance chart
- Probing of test structures on loose dice (tests are normally done on wafers)
- Ongoing efforts at improving small value and substrate-connected capacitor measurement methods

Report generation

The report generator is implemented in RS/1 (from Domain Solutions, formerly BBN Software), a table-based data analysis software package which includes extensive statistical and graphing functions and a Pascal-like procedural programming language. RS/1 is available for Unix, Windows 95, Windows NT, and VMS platforms. User-generated data tables, graphical objects, and programmed procedures are completely interchangeable among the various platforms.

The inputs to the report generator are the probing data files, an index file (.TP2) for the data files and a report request file. The report generator can output a report for a set of sites on a single wafer, for a set of wafers in a lot (wafer by wafer, including the lot average) or just the lot average for a set of wafers. The index files (.TP2), which show (in order) the meaning of each data file entry, provide a mapping from the tester measurement procedures to the logged data.

The ASCII probing log files contain the raw measurement data plus test conditions information, including the date and time of probing, the prober operator, the prober chuck temperature, and the wafer X:Y coordinates of each probed location, and the name of the specific test procedure driving the prober and the instruments.

In addition to tabular reports showing wafer and lot averages, the report generator also updates and is linked to a database which permits the creation of parameter-specific trend charts for a set of runs for a specified technology, or by wafer for a specific run, or normalized trend charts for a given run for a selected set of tests. The report generator can also generate graphs of parametric and functional data mapped to physical wafer locations.

A separate database of yield information is maintained for RMOSIS functional devices. USC/ISI has developed procedures for producing reports that combine this data with parametric data in a variety of ways.

Functional testing

USC/ISI addressed the functional test needs of the NSA design community by extending existing test resources at ISI. USC/ISI has an IMS ATS1 functional test system installed and in use. Previously the system consisted of a 14-slot mainframe with only two slots (one for 16 I/O and the other for parametric measurement) populated.

This system is used for functional test and characterization of USC/ISI-generated IC and MCM functional yield monitors (reference designs). The IMS system was expanded by populating the other 12 slots to offer a total of 208 I/O channels, each capable of 200 MHz at speed testing. Low-current measurement capability were also added to allow characterization of new low-power design techniques.

Hardware capabilities:

The per-pin architecture and modular I/O features of the IMS ATS1 allow maximum flexibility in matching the demands of rigorous device testing with economic considerations. As noted above, the system was extended to 208 I/O channels of 200 MHz test capability. Boundary scan and memory test modules are not part of this effort, but could be installed at a later date (in an expanded chassis).

Test conditions for each I/O pin can be configured separately, and modular, readily customized device fixtures are available, which means that the system can be easily configured for devices with varying pin assignments, package configurations, and test requirements. The additional capabilities offered by the optional boundary scan (JTAG) module enhance the power of the ATS1 for testing of JTAG-compatible ICs or multi-chip modules (MCMs).

Additionally two Keithley instruments (model 238 High-Current Source-Measure Unit, and model 6517 Electrometer / High Resistance Meter) support low current measurements (less than 1 picoampere) of the devices under functional test.

People resources:

Software for the tester controller includes an IMS-provided pattern conversion utility that facilitates conversion of test vectors in a variety of formats to IMS vectors. This smoothes the interface between the USC/ISI test staff and client designers and test engineers. The existing ISI report generator was modified to overlap parametric test results with functional yield test results.

The primary focus of this effort is low power measurement and characterization of functional die (on wafers and as packaged parts). Additionally this resource addresses the functional test queue at NSA. The level of effort covered one design per month.

TASK 3 - TECHNOLOGY DEVELOPMENT

USC/ISI assembled and managed experimental runs in support of the NSA effort to develop sources for new fabrication technologies and additional sources for current technologies.

Specific tasks that were performed

- Obtain vendor-specific geometry required on phototooling used in fabrication of wafers. This geometry typically consists of critical dimension marks, mask alignment targets, and process control monitors.
- Generate a test mask containing all layers of a vendor's geometry and all layers of sample NSA circuits. The objective is to verify the correct interpretation of vendor geometries, mask polarities, sizings, and the geometrical transformations necessary to convert NSA designs to mask data.
- Obtain approval of the test mask by the wafer fabricator.
- Merge vendor geometry and NSA designs onto a single mask sets to be used for the fabrication of wafers. In some cases this will require that geometrical transformations be applied to the NSA design data. The result is a collection of Mebes pattern files and a jobdeck capable of controlling mask makers' Electron Beam mask-making equipment.
- Subcontract for mask making and wafer fabrication.
- Perform testing of the NSA test structures as required.

Appendix 1 : RMOSIS3 runs and tasks

Run	Name	Vendors(s)	Description
R34J	Joker	Motorola	
R35K	Kangaroo	SPL	
R36L	Lion	Rockwell	
R37M	Mouse	SPL	
9303	Speed Trap	Texas Instruments	
9314	Vallor-Test	Allied Signal	
9316	GaAs	Texas Instruments	
9321	ASIG12	Tektron	
9323	Qual Run	Honeywell	
9324	639783	Silvaco	
9325	Lucite	Crystal-Like	
9327	K6C2	Westinghouse	
R41O	Owl	Rockwell	
R42P	Peacock	Rockwell	CMOS 1.2
R43Q	Quark	Rockwell	CMOS 1.2
R44S	Shamu	US2	Prototype #1
R44T	Tac	US2	
R44U	Ubiquitous	Rockwell	
R45V	Vampire	Rockwell	
R45W	Wolf	Rockwell	
R45X		Rockwell	
R46Z	Zenith	Rockwell	
R47A	Avalanche	IBM	
R49B	Bistro	Rockwell	
R4AC	Camaro	Rockwell	
R4CE	Ethanol	Rockwell	
9402	R36L	Westinghouse	
9403	ASIG12	Tektron	
9404	K6D2	Westinghouse	
9405	ASIG12	Tektron	
9407	KGV069	Spectrum	
9408	QualRun	US2	0.8 micron
9410	ASIG12	Tektron	
9411	ASIG12	Tektron	
9412	ASIG12	Tektron	
9413	665511	MIT	
9414	Rerailer	Tektron	
9416	655492	General Ceramics	
9417	ASIG12	Tektron	
9418	666687	Elan Microsystems	
9420	665510	Mentor Graphics	1.2 micron
9421	659513	Tektron	
9423	657480	UTMC	
9424	659509	Allied Signal	
9425	665568	Mentor Graphics	
9427	667918	Kyocera	

9428	665559	Pantronix	
9429	665540	Semi-Alloys	
9430	670231	Western Scientific	
R51F	Ferment	Rockwell	
R51G		ES2	
S54I	Iguana	ES2	0.8u
S55J	Jointly	Dupont	
S56L	Litmus	Rockwell	
S58M	Moonlight	Rockwell	CGaAs
S58N	Nell	Rockwell	
S58P	Photon	Rockwell	
S53H	Hippo	Rockwell-Loral	5 0.8u double metal wafers
S55J	Jointly	Dupont-MMS-Norsk	MCM: Sardeene/12 wafers
S56K	Kostley	Dupont-MMS-Norsk	MCM: Peanut/18 wafers
S58M	Mooonlight	Rockwell	12 5X reticles - CGaAs
S58O	Oliveoil	Harris-Motorola	Five 4-inch wafers
S58Q	Quasar	Rockwell	Three 4-inch masks
S59S	Simpson	Rockwell-Loral	Ten 5-inch wafers
S59T	Tea	Rockwell	Two 5-inch masks
S5AV	Veer	Rockwell	Two 4-inch masks
S5AW	Windsor	Rockwell	Four 4" and eight 5" masks
S5BX	Xi	Rockwell	Two 5-inch masks
S5BY	Yentil	Rockwell	Two 4-inch masks
S5BZ	Zeus	Rockwell	Six 4-inch masks
S5BA	Acid	Harris	Two 4-inch masks
S5BB	Bee	Rockwell	11 reticles
S5BC	Coral	Harris	9 4-inch reticles
S5BE	Eggplant	National	24 wafers
S5CF	Fritz	Rockwell	2 4-inch reticles
9502	670276	General Ceramics	Build 200 pkgs
9503	674523	Mentor Graphics	5 Pad cells to CMOSN library
9505	673409	Semi-Alloys	
9506	673413	Kyocera	
9507	674446	Azimuth Electronics	300-lead carriers & contactors
9510	676534	Coors	—
9511	676538	Kyocera	Packages and ceramic module
9512	679330	Johns Hopkins	3 metal layer MCM-D substrate development
9513	677987	General Ceramics	300 PGA packages, 313 pins
9515	Caribou	Tektron	
9516	680609	Kyocera	
9517	665559	Pantronix	
9518	647373	Florida Inst. Tech.	Enhancements to Cadence Gate Ensemble
9519		Norsk	Pkging Peanut, S56K
9520		Norsk	Pkging Sardeene, S55J
9521	686434	Kyocera	500 196 LD flat packages
9522		USC/ISI/Athas	Adiabatic Tachometer driver design
9524	688152	Fancourt	Lead forming equipment
9525	688149	Azimuth Electronics	20 sockets
9526	689476	Cerprobe	Load boards

9527	689475	Coors	100 lead quad flat packs
9528		Tektron	
9529	690193	Lehighton	2 fixture cards for Sardeene
9530	691543	National	48 wafers/2 lots of 24
9531		Honeywell	70 coated & sealed StreetSweeper parts
9532	Tatertot	MMS	24 MCM substrates
S61G	Gem	Rockwell	Three 4-inch masks
S61H	Hot Air	Harris	Fourteen 4-inch masks
S61J	Jasper	Harris	Four 5-inch masks
S61K	Kelsey	Rockwell	Eight 1X 5-inch masks
S62I	Indiana	Rockwell	Four 5-inch masks
S62L	Leo	Harris	Three 4-inch masks
S62M	Memories	Rockwell	One 6-inch mask
S62O	Ole	Rockwell	Five 5-inch masks
S63P	Politics	Rockwell	Three 5-inch masks
S64Q	Quesadilla	National	24 CS080 wafers
S64S	Sally	Harris	12 masks
S64T	Target	Rockwell	21 four-inch masks
S64U	Uptown	Harris	21 four-inch masks
S64V	Vixon	Rockwell	3 five-inch masks
S66W	Wonka	Honeywell	Five 4-inch wafers
S66X	Xyloid	Rockwell	1 six-inch mask
S67B	Bartlett	Harris	Six 5-inch masks
S67C	Cobra	Harris	Two 5-inch masks
S68D	Dive-in	National	24 wafers
S68E	Ewin	Rockwell	13 5-inch full wafer masks
S68F	Frederick	Harris	13 5-inch masks
S68G	Gorilla	Rockwell	2 4-inch masks
S68H	Honcho	Harris	12 5-inch masks
S69I	Indigo	Rockwell	1 6-inch mask
S69J	Jolly	Rockwell	3 5-inch masks
S69K	Kmart	Harris	4 5-inch masks
S69L	Luckys	Harris	2 5-inch masks
S69M	Millennium	National	6 CS100HE wafers
S6BN	Narvana	Rockwell	8 5-inch masks
S6BO	Orchard	Harris	1 5-inch mask
S6BP	Pigskin	National	24 CS65 wafers
S6BQ	Que	Harris	1 5-inch mask
S6CR	Rapture	Rockwell	1 6-inch masks
9601	ASIG	Tektron	300 burned in parts
9602	ASIG12	Tektron	300 burned in parts
9603	ASIG12	Pantronix	500 assembled parts
9604	692444	Spectrum	40 packages
9605		General Ceramics	MCM packages
9606		Boeing	Epoch radhard cell library
9608		Ultratest Intl.	ESD latch-up testing
9609		Rockwell-MMS	Tatertot, MCM dedicated run
9610		Tektron	Peanut assembly
9611		Tektron	Tatertot assembly
9612	N62H	Rockwell-MMS	Fourrunner

9613		Tektron	Sardeene assembly
9614		Kyocera	KGV-69 packages
9615	Cardholder	UTMC	Fab, assemble & test 400 parts
9616	Tablot	Pantronix	Tablot assembly
9617		Pantronix	Packages
9618		Advanced Microelectronics	Model parameters
9619	ASIG12	Tektron	ASIG12 assembly
9620	FIT	Mentor	GDT generators
9621		Pantronix	Package purchase
9622	Talbot	Pantronix	Talbot assembly
9623	ASIG15	Pantronix	Packages
9624	PIM1	Pantronix	PIM1 electrical testing
9625		Florida Inst. Tech.	Equipment purchase
9626	ASIG12	Pantronix	ASIG12 assembly
9627	ASIG15	Pantronix	ASIG15 assembly
9628		Mississippi State Univ.	Device and interconnect modeling
9629		GTSI	Software purchase
9630	007607	WinBook Computers	Computer equipment
9631		Sun	Computer equipment
9632	N62F#2	MMS	Tatertot
9633		Tektron	Tatertot assembly
9634		Pantronix	QFP tray order
9635	Talbot	Pantronix	packages
9636	SRAM die	Electronic Designs	190 slow SRAM die
9637		Tektron	Assembly of 5 MCMs
9638		Sun	Accessories
9639		Kyocera	200 packages
9640		GTSI	Printer
9641		Micro Warehouse	Software
9642		MMS	Sardeene fabrication
9643		Ultratest	Failure analysis

Appendix 2 : Accounts fabricated under account (1104-NSA-MPR/NSA-RMOSIS3)

Design	Fab Id	Design Name	Technology	Design Size (sq. mm)	Quantity	Cost ($)
41202	N3BEAA	SARA_4A	CMOSN	7.236	25	
41204	N3BEAB	SARA_4C	CMOSN	7.244	25	
41203	N3BEAC	SARA_4B	CMOSN	7.244	25	
41201	N3BEAD	SARA_1C	CMOSN	7.252	25	
41200	N3BEAE	INCO	CMOSN	10.966	25	
Run N3BE						65,245
41171	N3CIAA	RACER-X	CMOSX	144.962	25	
Run N3CI						56,995
42355	N43FAB	BJTCOMP	SCMOS	3.756	50	1,995
42358	N43FAC	HFAX	SCMOS	3.756	50	1,995
42354	N43FAD	BANDGAP	SCMOS	3.756	50	1,995
42359	N43FAE	INS	SCMOS	3.756	50	1,995
42357	N43FAF	CMOSTEST	SCMOS	3.756	50	1,995
42360	N43FAG	PHOTO_ARRAY	SCMOS	3.756	50	1,995
42361	N43FAH	PNPTEST	SCMOS	3.756	50	1,995
42356	N43FAJ	CMOSCOMP	SCMOS	3.756	50	1,995
42616	N44QAD	S1	CMOSX	27.201	25	
42612	N44QAF	LTACH408	CMOSN	55.771	25	
Run N44Q						34,822
42899	N45WAU	CONNELLY-THMAY94	SCMOS	9.751	25	3,375
42614	N46DAL	NICK3SCALED10	CMOSN	14.043	25	5,477
42943	N46EFM	BUS-MONITOR	SCMOS	31.229	76	13,650
43310	N47HAB	CONNELLY_ADJULY9	SCMOS	3.756	25	1,579
43440	N48MAA	TAPDANCE	CMOSN	69.797	25	
Run N48M						87,322
43435	N48NAB	CONNELLY_ADAUG94	SCMOS	3.756	25	1,579
43436	N48NAC	CONNELLY_RSAUG94	SCMOS	3.756	25	1,579
43936	N4AYAA	WIDGET3	CMOSN	87.767	25	
Run N4AY						86,972
43955	N4AZAK	TEMPESTIV	CMOSN	24.399	50	12,931
44973	N52VAB	CONNELLY-THFEB2	SCMOS	3.756	25	1,579
44972	N52VAH	CONNELLY-THFEB1	SCMOS	9.751	25	3,375
45499	N53CAE	LATTICE1	CMOSX	12.473	25	4,864
45738	N54FAB	CONNELLY_HOLMAN_	SCMOS	3.756	25	1,579
900205	N55MYB	NSCX_V332	CMOSX	33.257	25	12,970
900181	N55NYD	SR50X50_NSCX_VER	CMOSX	28.713	25	11,648
47079	N5AIAA	ESD_14TB	SCMOS	3.186	25	

47082	N5AIAD	L1362_05ESD	CS050N	27.353	25	
47084	N5AIAE	L1368_XTACH05	CS050N	28.201	25	
47083	N5AIAF	L1364_05PADS	CS050N	35.074	25	
47081	N5AIAG	L1360_NIGHTPCM	CS050N	41.438	25	
Run N5AI						106,529
47297	N5BNAQ	CONNELLY_RSNOV95	SCMOS	9.751	25	4,058
47296	N5BNAR	CONNELLY_RSNOV95	SCMOS	9.751	25	4,058
47978	N61AAA	CINCO	CMOSN	88.191	25	
Run N61A						57,929
48418	N63KAA	MULTIKRON2_40935	HP_CMOS34	69.115	25	
48422	N63KAB	MULTIKRON2_40935	HP_CMOS34	69.115	25	
Run N63K						55,429
48247	N64OAX	CS050N YIELD MON	CS050N	15.441	25	9,265
48513	N64PBM	JAC_RWS_APR96	SCMOS	9.751	60	10,590
48569	N64RAA	BANDGAP_HP_EDGE	CS050N	2.255	25	
48515	N64RAB	PMODEL	CS050N	3.183	25	
48514	N64RAC	NMODEL	CS050N	3.183	25	
48505	N64RAD	BOBMODEL	CS050N	6.666	25	
48504	N64RAE	CHRONOS	CS050N	211.150	25	
Run N64R						126,529
900222	N64SYB	NSCX_V334	CMOSX	33.291	25	16,313
48803	N65WAB	JAC_RWS_MAY96A	SCMOS	9.751	25	4,058
48804	N65XAW	JAC_RWS_MAY96B	SCMOS	9.751	25	4,058
49175	N66DAM	JAC_RWS_JUN9612	SCMOS	33.281	25	12,764
49177	N66DAN	8080 ALU	CMOSN	53.036	~~100~~	64,173
49221	N66EAR	AEITACH08 ADIATIC	CMOSX	52.492	25	25,721
49466	N67HAP	CMOSX_RING_STACK	CMOSX	4.798	25	2,351
49508	N67IAA	FOOBAR	CMOSN	81.605	25	
Run N67I						95,799
49465	N68LAJ	RING123	CMOSH	4.989	25	2,993
900288	N68OYA	STRIP3_NSCT3M08_	CMOSN	10.292	25	5,043
49990	N6AWAA	TAPDANCE2	CMOSN	69.797	25	
Run N6AW						95,799
50013	N6AYAS	05ESD_2	CS050N	27.353	25	17,237